



PIER Energy-Related Environmental Research

Environmental Impacts of Energy Generation, Distribution and Use

Research on Estimating the Environmental Benefits of Restoration to Mitigate or Avoid Environmental Impacts Caused by California Power Plant Cooling Water Intake Structures

Interagency Agreement #: 500-02-004

Institution: Stratus Consulting, Inc.

Award Amount: \$71,319

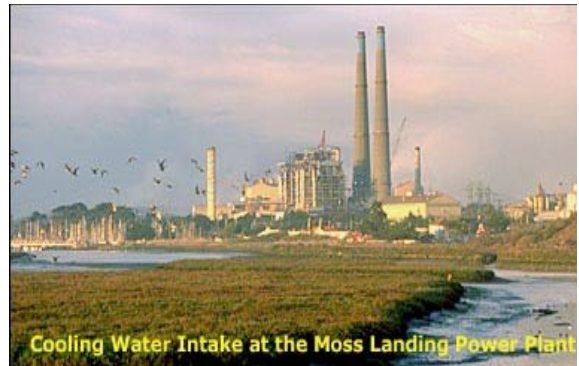
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The Issue

When the California Energy Commission licenses an electricity generating facility, it evaluates the impacts of the facility on the environment and public health. Based on this evaluation, the Commission often recommends structural or operational modifications that will mitigate or avoid harmful impacts.

Environmental restoration is one technique that is used to lessen or eliminate harmful environmental impacts of power plants. However, there is no standard method that can provide reliable, quantitative estimates of the environmental benefits from specific restoration actions. As a result, the effectiveness and costs of environmental restoration are often called into question, and it is sometimes difficult for power companies, regulators, and other decision makers to identify and choose the amount (and subsequent cost) of restoration that is appropriate to mitigate or avoid the environmental losses for a particular situation.



One application of environmental restoration is to address impacts of power plant cooling water intake structures (CWIS) on fish and other aquatic life. Millions of gallons of water can pass through a cooling water intake each day, and aquatic life that are caught against or pulled into these structures can be injured or killed. On a federal level, these structures and their operation is regulated by Section 316 (b) of the Clean Water Act.

Project Description

In this project, PIER-EA funded work by Stratus Consulting, Inc. to identify the key factors and methods necessary to develop reliable, quantitative estimates of the benefits of restoration to mitigate or avoid the impacts of California power plant CWIS on fish and shellfish.

Researchers also identified data gaps that impede the development of reliable estimates of the type, amount, and cost of restoration, and identified field studies and monitoring programs that could fill those gaps. This information can help support the development of regional restoration plans that can mitigate the environmental impacts of CWIS.

The research was conducted within the framework of the habitat-based replacement cost (HRC) method developed to evaluate the impacts of CWIS on all life stages and trophic levels of fish and shellfish. The HRC approach estimates the types, amount, and cost of restoration actions that will support rates of fish and shellfish production sufficient to offset losses. The method is based on the resource replacement approach, where replacement is achieved through habitat restoration as opposed to conventional replacement techniques such as fish stocking.

PIER Program Objectives and Anticipated Benefits for California

This project offers numerous benefits and meets the following PIER program objectives:

- **Providing environmentally sound electricity.** By developing a strong scientific basis for selecting and scaling environmental restoration activities, this research will help operators, regulators, and decision makers identify and implement the most appropriate mitigation measures for offsetting the impacts of power plant CWIS. It will also serve as a blueprint that can be used to facilitate the development of methods that will reliably quantify the environmental benefits of specific restoration activities, such as thermal discharge impacts on fish, aquatic or terrestrial habitat loss or degradation, or bird kills from wind turbines or transmission equipment.
- **Providing affordable electricity.** A reliable method for identifying effective, economical environmental restoration solutions can reduce mitigation costs, and subsequently, the costs for producing electricity.

Results

As the result of the literature and data reviews, and discussions with fisheries experts, the researchers reached several general conclusions:

- Hundreds of species are affected by cooling water intake structures in California; however, current impacts are poorly known for most facilities, because most existing studies are decades old. Moreover, the majority of species impinged and entrained are forage species whose life histories are largely unknown.
- Many different kinds of restoration actions, including both habitat and nonhabitat-based alternatives, have the potential to benefit impinged and entrained species. However, additional study is needed to evaluate the ecological value of habitat versus nonhabitat-based alternatives, and there is a need to identify and prioritize sites for habitat restoration on a regional basis.
- Different scaling methods can produce different (but often equally plausible) results, depending on the assumptions and data used. It will be important to develop ranges of scaling estimates using multiple methods.
- Although updated 316(b) studies, including restoration evaluations, have been conducted recently at the Diablo Canyon, Moss Landing, and Morro Bay facilities, many more facilities in California require updated studies.

These conclusions and others, along with recommendations for future work, are detailed in the final report.

Legislative Districts

The PIER Environmental Area is in Sacramento, which is located in Senate District 6 (Senator Deborah Ortiz) and the 9th Assembly District (Assembly member Darrell Steinberg).

Final Report

The complete report of results of this research are available online at:

http://www.energy.ca.gov/pier/final_project_reports/CEC-500-2004-092.html.

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